

Docket No. 2001-019-TAP

CLAIMS:

What is claimed is:

- 1 1. A reduced sensitivity spin valve sensor apparatus,
2 comprising:
3 a spin valve sensor; and
4 at least one magnetic effect inducing device,
5 wherein the at least one magnetic effect inducing device
6 induces a magnetic field to the spin valve sensor to
7 thereby reduce a sensitivity of a free layer of the spin
8 valve sensor to applied magnetic fields
- 1 2. The reduced sensitivity spin valve sensor apparatus
2 of claim 1, wherein the at least one magnetic effect
3 inducing device is at least one permanent magnet.
- 1 3. The reduced sensitivity spin valve sensor apparatus
2 of claim 1, wherein the at least one magnetic effect
3 inducing device is a pair of permanent magnet stabilizing
4 elements.
- 1 4. The reduced sensitivity spin valve sensor apparatus
2 of claim 1, wherein the at least one magnetic effect
3 inducing device is magnetized in a longitudinal direction
4 parallel to the free layer of the spin valve sensor.
- 1 5. The reduced sensitivity spin valve sensor apparatus
2 of claim 3, wherein the permanent magnet stabilizing
3 elements are cobalt-platinum/chromium magnets.

T05330-02E3B9

Docket No. 2001-019-TAP

1 6. The reduced sensitivity spin valve sensor apparatus
2 of claim 1, wherein the at least one magnetic effect
3 inducing device reduces the spin valve sensor's
4 propensity to saturate.

1 7. The reduced sensitivity spin valve sensor apparatus
2 of claim 1, wherein the at least one magnetic effect
3 inducing device is an antiferromagnet layer.

1 8. The reduced sensitivity spin valve sensor apparatus
2 of claim 7, wherein the antiferromagnet layer aligns
3 atomic moments in the free layer of the spin valve
4 sensor.

1 9. The reduced sensitivity spin valve sensor apparatus
2 of claim 8, wherein the aligned atomic moments generate a
3 longitudinal exchange induced bias field in the free
4 layer that reduces the sensitivity of the free layer to
5 applied magnetic fields.

1 10. The reduced sensitivity spin valve sensor apparatus,
2 further comprising:
3 at least one insulating film; and
4 at least one magnetic shield, wherein the insulating
5 film is one of alumina, silicon nitride and aluminum
6 nitride.

1 11. A method of making a reduced sensitivity spin valve
2 sensor apparatus, comprising:
3 providing a spin valve sensor; and

T06330-0246350

Docket No. 2001-019-TAP

4 providing at least one magnetic effect inducing
5 device, wherein the at least one magnetic effect inducing
6 device induces a magnetic field to the spin valve sensor
7 to thereby reduce a sensitivity of a free layer of the
8 spin valve sensor to applied magnetic fields.

1 12. The method of making a reduced sensitivity spin
2 valve sensor apparatus of claim 11, wherein the at least
3 one magnetic effect inducing device is at least one
4 permanent magnet.

1 13. The method of making a reduced sensitivity spin
2 valve sensor apparatus of claim 11, wherein the at least
3 one magnetic effect inducing device is a pair of
4 permanent magnet stabilizing elements.

1 14. The method of making a reduced sensitivity spin
2 valve sensor apparatus of claim 11, wherein the at least
3 one magnetic effect inducing device is magnetized in a
4 longitudinal direction parallel to the free layer of the
5 spin valve sensor.

1 15. The method of making a reduced sensitivity spin
2 valve sensor apparatus of claim 13, wherein the permanent
3 magnet stabilizing elements are cobalt-platinum/chromium
4 magnets.

1 16. The method of making a reduced sensitivity spin
2 valve sensor apparatus of claim 11, wherein the at least

2001-019-TAP

Docket No. 2001-019-TAP

3 one magnetic effect inducing device reduces the spin
4 valve sensor's propensity to saturate.

1

1 17. The method of making a reduced sensitivity spin
2 valve sensor apparatus of claim 11, wherein the at least
3 one magnetic effect inducing device is an antiferromagnet
4 layer.

1

1 18. The method of making a reduced sensitivity spin
2 valve sensor apparatus of claim 17, wherein the
3 antiferromagnet layer aligns atomic moments in the free
4 layer of the spin valve sensor.

1

1 19. The method of making a reduced sensitivity spin
2 valve sensor apparatus of claim 18, wherein the aligned
3 atomic moments generate a longitudinal exchange induced
4 bias field in the free layer that reduces the sensitivity
5 of the free layer to applied magnetic fields.

1

1 20. The method of making a reduced sensitivity spin
2 valve sensor apparatus of claim 11, further comprising:
3 providing at least one insulating film; and
4 providing at least one magnetic shield, wherein the
5 insulating film is one of alumina, silicon nitride and
6 aluminum nitride.

1

1 21. The reduced sensitivity spin valve sensor apparatus
2 of claim 1, wherein the at least one magnetic effect
3 inducing device includes a pair of antiferromagnetic
4 layers.

1

T06330-624550

Docket No. 2001-019-TAP

1 22. The reduced sensitivity spin valve sensor apparatus
2 of claim 21, wherein the pair of antiferromagnetic layers
3 includes an antiferromagnetic layer that pins a
4 ferromagnetic layer at zero degrees relative to a long
5 axis of the free layer.

1 23. The reduced sensitivity spin valve sensor apparatus
2 of claim 21, wherein the pair of antiferromagnetic layers
3 includes an antiferromagnetic layer that pins a
4 ferromagnetic layer at ninety degrees relative to a long
5 axis of the free layer.

1 24. The reduced sensitivity spin valve sensor apparatus
2 of claim 21, wherein the pair of antiferromagnet layers
3 includes a first antiferromagnet layer pinned at zero
4 degrees relative to a long axis of the free layer, and a
5 second antiferromagnet layer pinned at ninety degrees
6 relative to the long axis of the free layer.

1 25. The reduced sensitivity spin valve sensor apparatus
2 of claim 24, wherein the first and second
3 antiferromagnetic layers have different blocking
4 temperatures.

1 26. The reduced sensitivity spin valve sensor apparatus
2 of claim 21, further comprising a ferromagnetic layer
3 spaced from the free layer by a nonmagnetic layer.

1 27. The reduced sensitivity spin valve sensor apparatus
2 of claim 26, wherein a thickness of the nonmagnetic layer

20250906 04:45:30

Docket No. 2001-019-TAP

3 is used to control an amount of ferromagnetic exchange
4 between the ferromagnetic layer and the free layer.

1 28. The reduced sensitivity spin valve sensor apparatus
2 of claim 27, wherein the thickness of the nonmagnetic
3 layer is approximately between 10 and 25 Angstroms.

1 29. The method of claim 11, wherein the at least one
2 magnetic effect inducing device is a pair of
3 antiferromagnetic layers.

1 30. The reduced sensitivity spin valve sensor apparatus
2 of claim 29, wherein the pair of antiferromagnetic layers
3 includes an antiferromagnetic layer that pins a
4 ferromagnetic layer at zero degrees relative to a long
5 axis of the free layer.

1 31. The reduced sensitivity spin valve sensor apparatus
2 of claim 29, wherein the pair of antiferromagnetic layers
3 includes an antiferromagnetic layer that pins a
4 ferromagnetic layer at ninety degrees relative to a long
5 axis of the free layer.

1 32. The reduced sensitivity spin valve sensor apparatus
2 of claim 29, wherein the pair of antiferromagnetic layers
3 includes a first antiferromagnetic layer that pins a
4 first ferromagnetic layer at zero degrees relative to a
5 long axis of the free layer, and a second
6 antiferromagnetic layer that pins a second ferromagnetic

T06230-046550

Docket No. 2001-019-TAP

7 layer at ninety degrees relative to the long axis of the
8 free layer.

1 33. The reduced sensitivity spin valve sensor apparatus
2 of claim 32, wherein the first and second
3 antiferromagnetic layers have different blocking
4 temperatures.

1 34. The reduced sensitivity spin valve sensor apparatus
2 of claim 11, further comprising a ferromagnetic layer
3 spaced from the free layer by a nonmagnetic layer.

1 35. The reduced sensitivity spin valve sensor apparatus
2 of claim 34, wherein a thickness of the nonmagnetic layer
3 is used to control an amount of ferromagnetic exchange
4 between the ferromagnetic layer and the free layer.

1 36. The reduced sensitivity spin valve sensor apparatus
2 of claim 35, wherein the thickness of the nonmagnetic
3 layer is approximately between 10 and 25 Angstroms.

2001-019-TAP